Listing of Claims

1. (Original) A method of processing a plurality of keep-alive messages generated by a corresponding plurality of end systems, each of said plurality of keep-alive messages being designed to request the status of a corresponding point to point (PPP) session implemented on a communication network, said method comprising:

receiving in an aggregation device said plurality of keep-alive messages;

generating in said aggregation device an aggregated request packet which indicates that the status of said PPP sessions is requested; and

sending said aggregated request packet on said communication network to a peer aggregation device.

2. (Original) The method of claim 1, further comprising:

receiving said aggregated request packet in said peer aggregation device;

indicating the status of said plurality of sessions in an aggregated reply packet; and

sending said aggregated reply packet to said aggregation device.

3. (Original) The method of claim 1, further comprising receiving in said aggregation device an aggregated reply packet from said peer aggregation device, wherein said aggregated reply packet indicates the status of at least some of said plurality of PPP sessions.

4. (Original) The method of claim 3, further comprising sending a proxy keep-alive reply message to one of said plurality of end systems originating a corresponding one of said keep alive-messages without waiting for said aggregated reply packet.

5. (Original) The method of claim 4, further comprising:

maintaining a remote status table in said aggregation device, wherein said remote status table indicates the status of sessions supported by said aggregation device;

updating said remote status table with the information in said aggregated reply packet; and

generating said proxy keep-alive reply according to said remote status table.

6. (Original) The method of claim 5, wherein said proxy keep-alive message indicates that the corresponding session is alive/OK when a first keep-alive message is received for the corresponding session.

7. (Original) The method of claim 6, further comprising initializing the status of each of said session to alive/OK such that said proxy keep-alive message in response to said first keep-alive message indicates alive/OK status.

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8. (Original) The method of claim 1, wherein said communication network is implemented using one of frame relay, ATM and IP networks.

9. (Original) The method of claim 1, wherein said aggregation device is one of a network access server and home gateway.

10. (Original) A method of processing an aggregated request packet in an aggregation device, wherein said aggregated request packet indicates that the status of a plurality of point-to-point sessions are requested, said method comprising:

examining said aggregated request packet to determine said plurality of point-to-point sessions;

determining the status of each of said plurality of point-to-point sessions;

generating an aggregated reply packet indicating the status of said plurality of point-to-point sessions; and

sending said aggregated reply packet to said peer aggregation device.

11. (Original) The method of claim 10, wherein said determining comprises accessing a local status table which contains the status information of at least some of said plurality of point-to-point sessions.

12. (Original) The method of claim 10, wherein said generating comprises including a client magic number associated with each of said plurality of point-to-point sessions.

13. (Original) The method of claim 10, wherein said generating comprises setting a bit to one logical value to indicate that a corresponding one of said plurality of sessions is OK/alive, and to another logical value to indicate that said corresponding one of said plurality of session not OK/alive.

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14. (Original) The method of claim 10, wherein said aggregation device comprises one of a network access server (NAS) and a home gateway implemented in a communication network.

15. (Original) An aggregation device for processing a plurality of keep-alive messages generated by a corresponding plurality of end systems, each of said plurality of keep-alive messages being designed to request the status of a corresponding point to point (PPP) session implemented on a communication network, said aggregation device comprising:

an input interface receiving said plurality of keep-alive messages;

a message aggregator coupled to said input interface, said message aggregator examining said plurality of message and generating data according to a format indicating that the status of said PPP sessions is requested; and

an output interface sending an aggregated request packet on said communication network to a peer aggregation device, said aggregated request packet containing said data generated by said message aggregator.

16. (Original) The aggregation device of claim 15, further comprising an encapsulator encapsulating said data in a packet suitable for transmission on said communication network.

17. (Original) The aggregation device of claim 16, further comprising:

a remote status table indicating the status of sessions supported by said aggregation device; and

a de-aggregator receiving an aggregated reply packet from said peer aggregation device, wherein said aggregated reply packet indicates the status of at least some of said plurality of PPP sessions, said de-aggregator updating said remote status table with the information in said aggregated reply packet.

A12 18. (Original) The aggregation device of claim 17, further comprising a proxy reply unit sending a proxy keep-alive reply message to one of said plurality of end systems originating a corresponding one of said keep alive-messages without waiting for said aggregated reply packet.

19. (Original) The invention of claim 18, wherein said aggregation device comprises a network access server.

20. (Original) The aggregation device of claim 18, wherein said aggregated request packet contains a magic number related to each of the corresponding sessions.

21. (Original) An aggregation device for processing a plurality of keep-alive messages generated by a corresponding plurality of end systems, each of said plurality of keep-alive messages being designed to request the status of a corresponding point to point (PPP) session implemented on a communication network, said aggregation device comprising:

first means for receiving said plurality of keep-alive messages;

means for generating an aggregated request packet which indicates that the status of said PPP sessions is requested; and

means for sending said aggregated request packet on said communication network to a peer aggregation device.

22. (Original) The aggregation device of claim 21, further comprising second means for receiving an aggregated reply packet from said peer aggregation device, wherein said aggregated reply packet indicates the status of at least some of said plurality of PPP sessions.

23. (Original) The aggregation device of claim 22, further comprising means for sending a proxy keep-alive reply message to one of said plurality of end systems originating a corresponding one of said keep alive-messages without waiting for said aggregated reply packet.

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24. (Original) The aggregation device of claim 23, further comprising:

means for maintaining a remote status table in said aggregation device, wherein said remote status table indicates the status of sessions supported by said aggregation device;

means for updating said remote status table with the information in said aggregated reply packet; and

means for generating said proxy keep-alive reply according to said remote status table.

25. (Original) An aggregation device for processing an aggregated request packet, wherein said aggregated request packet indicates that the status of a plurality of point-to-point sessions are requested, said aggregation device comprising:

means for examining said aggregated request packet to determine said plurality of point-to-point sessions;

means for determining the status of each of said plurality of point-to-point sessions;

means for generating an aggregated reply packet indicating the status of said plurality of point-to-point sessions; and

means for sending said aggregated reply packet to said peer aggregation device.

26. (Original) The aggregation device of claim 25, wherein said means for determining comprises means for accessing a local status table which contains the status information of at least some of said plurality of point-to-point sessions.

27. (Original) The aggregation device of claim 25, wherein said means for generating includes a client magic number associated with each of said plurality of point-to-point sessions.

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28. (Original) The aggregation device of claim 25, wherein said means for generating sets a bit in said aggregated reply packet to one logical value to indicate that a corresponding one of said plurality of sessions is OK/alive, and to another logical value to indicate that said corresponding one of said plurality of session not OK/alive.

29. (Original) The aggregation device of claim 25, wherein said aggregation device comprises one of a network access server (NAS) and a home gateway implemented in a communication network.

30. (Original) An aggregation device for processing an aggregated request packet, wherein said aggregated request packet indicates that the status of a plurality of point-to-point sessions are requested, said aggregation device comprising:

an input interface receiving said aggregated request packet;

a de-encapsulator examining said aggregated request packet to determine that said aggregated request packet relates to requesting the status of point-to-point sessions;

a reply generator determining the status of each of said plurality of point-to-point sessions, and generating an aggregated reply packet indicating the status of said plurality of point-to-point sessions; and

an output interface sending said aggregated reply packet to said peer aggregation device.

31. (Original) The aggregation device of claim 30, further comprising a local status table storing the status information of at least some of said plurality of point-to-point sessions, wherein said reply generator determines the status of said at least some of said plurality of point-to-point sessions by accessing said local status table.

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32. (Original) The aggregation device of claim 31, further comprising a session manager updating the status of said plurality of point-to-point sessions in said local status table.

33. (Original) The aggregation device of claim 30, wherein said reply generator includes in said aggregated reply packet a client magic number associated with each of said plurality of point-to-point sessions.

34. (Original) The aggregation device of claim 30, wherein said reply generator sets a bit in said aggregated reply packet to one logical value to indicate that a corresponding one of said plurality of sessions is OK/alive, and to another logical value to indicate that said corresponding one of said plurality of session not OK/alive.

35. (Original) The aggregation device of claim 30, further comprising a keep-alive processor coupled to said de-encapsulator, wherein said keep-alive processor examines said aggregated request packet to determine that status of point-to-point sessions is requested and causes said reply generator to generate said aggregated reply packet.

36. (Original) The aggregation device of claim 30, wherein said aggregation device comprises one of a network access server (NAS) and a home gateway implemented in a communication network.

37. (Original) A computer-readable medium carrying one or more sequences of instructions for causing a aggregation device to process a plurality of keep-alive messages generated by a corresponding plurality of end systems, each of said plurality of keep-alive messages being designed to request the status of a corresponding point to point (PPP) session implemented on a communication network, wherein execution of said one or more sequences of instructions by one or more processors contained in said aggregation device causes said one or more processors to perform the actions of:

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receiving in an aggregation device said plurality of keep-alive messages;

generating in said aggregation device an aggregated request packet which indicates that the status of said PPP sessions is requested; and

sending said aggregated request packet on said communication network to a peer aggregation device.

38. (Original) The computer-readable medium of claim 37, further comprising:

receiving said aggregated request packet in said peer aggregation device;

indicating the status of said plurality of sessions in an aggregated reply packet; and

sending said aggregated reply packet to said aggregation device.

39. (Original) The computer-readable medium of claim 37, further comprising receiving in said aggregation device an aggregated reply packet from said peer aggregation device, wherein said aggregated reply packet indicates the status of at least some of said plurality of PPP sessions.

40. (Original) The computer-readable medium of claim 39, further comprising sending a proxy keep-alive reply message to one of said plurality of end systems originating a corresponding one of said keep alive-messages without waiting for said aggregated reply packet.

41. (Original) The computer-readable medium of claim 40, further comprising:

maintaining a remote status table in said aggregation device, wherein said remote status table indicates the status of sessions supported by said aggregation device;

updating said remote status table with the information in said aggregated reply packet; and

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generating said proxy keep-alive reply according to said remote status table.

42. (Original) A computer-readable medium carrying one or more sequences of instructions for causing an aggregation device to process an aggregated request packet, wherein said aggregated request packet indicates that the status of a plurality of point-to-point sessions are requested, wherein execution of said one or more sequences of instructions by one or more processors contained in said aggregation device causes said one or more processors to perform the actions of:

examining said aggregated request packet to determine said plurality of point-to-point sessions;

determining the status of each of said plurality of point-to-point sessions;

generating an aggregated reply packet indicating the status of said plurality of point-to-point sessions; and

sending said aggregated reply packet to said peer aggregation device.

43. (Original) The computer-readable medium of claim 42, wherein said determining comprises accessing a local status table which contains the status information of at least some of said plurality of point-to-point sessions.

44. (Original) The computer-readable medium of claim 42, wherein said generating comprises including a client magic number associated with each of said plurality of point-to-point sessions.

45. (Original) The computer-readable medium of claim 42, wherein said generating comprises setting a bit to one logical value to indicate that a corresponding one of said plurality of sessions is OK/alive, and to another logical value to indicate that said corresponding one of said plurality of session not OK/alive.

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46. (Original) The computer-readable medium of claim 42, wherein said aggregation device comprises one of a network access server (NAS) and a home gateway implemented in a communication network.

47. (New) A communication network comprising:

a first aggregation device receiving a plurality of keep-alive messages generated by a corresponding plurality of end systems, each of said plurality of keep-alive messages being designed to request the status of a corresponding point to point (PPP) session implemented on said communication network, said first aggregation device generating an aggregated request packet which indicates that the status of said PPP sessions is requested, and sending said aggregated request packet; and

a peer aggregation device receiving said aggregated request packet and indicating the status of said plurality of sessions in an aggregated reply packet, said peer aggregation packet sending said aggregated reply packet to said first aggregation device.

48. (New) The communication network of claim 47, wherein said first aggregation device is located at an edge of said communication networks.

49. (New) The communication network of claim 48, further comprising an access network coupling said first aggregation device to said corresponding plurality of end systems, wherein said plurality of keep-alive messages are received on said access network.

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50. (New) The communication network of claim 49, wherein said first aggregation device and said peer aggregation device respectively comprise a network access server (NAS) and a home gateway.